SCIENCE

FRIDAY, SEPTEMBER 16, 1887.

THE LATEST NEWS from Stanley is dated Yambuya Rapids on the Aruvimi River. This is the most eastern point that could be reached by steamers, and here the overland journey to the Mvutan Nsige was to begin. The expedition, which consisted of 612 men, left Stanley Pool on May 1, on the 'Henry Reed,' of the American Baptist Mission, with 131 men on board; the 'Stanley,' of the Kongo Free State, carrying 364 men, 500 loads of baggage and goods, nine riding asses and a herd of goats, and the 'Peace,' of the English Baptist Mission, with 117 men on board, and towing two boats. The 'Stanley' towed the hull of the steel steamer 'Florida,' which had been launched the day before. Two miles above Kinshassa the 'Peace' met with an accident, her rudder being broken, and she had to return to Leopoldville for repairs. After this accident the expedition travelled steadily on; but the 'Peace' proved to be very slow, and was unable to keep up with the other steamers. A short distance below Bolobo another accident befell the expedition. The 'Stanley' struck a reef, and one of her sections was completely wrecked. Fortunately she could be restored to use by patching plates underneath. In order to make up for the time lost, Major Barttelot marched overland from Wamboko River to Kwamouth, and his party was afterward brought up to Bolobo by the 'Stanley.' Meanwhile the engineer of the 'Peace' had resolved to screw down the upper safety-valve, and by this expedient enabled the 'Peace' to proceed at the same rate as the other steamers. The journey from Bolobo to the rapids of the Aruvimi was effected without any further delays or incidents. On June 18 this place was reached, and Stanley proceeded at once to build an intrenched camp, in which Major Barttelot is to remain. While Stanley's steamers ascended the Aruvimi, Tippo-Tip was conveyed on the 'Henry Reed' to Stanley Falls station, of which he is the chief. He was accompanied by 96 Zanzibari, and Major Barttelot, who had 40 Sudanese soldiers with him, commanded the steamer. It seems that Stanley was going to leave the Arabian trader at Stanley Falls, and proceed to the Mvutan Nsige alone. Barttelot was to return the day after his arrival at Stanley Falls, and to rejoin Stanley at Aruvimi Falls. The natives of Yambuya would not allow the expedition to land, but, on hearing the steam-whistles, fled into the woods. The next day a few returned, and were sent off with presents. Stanley hoped to gain their confidence within a short time. On June 20 the 'Stanley' left the Yambuya Falls, and arrived at Leopoldville on July 2. These are the latest letters from Stanley so far; but the cable informs us that he found the river navigable above the Yambuya Falls, and that he was able to proceed in boats. Probably the 'Henry Reed' brought this news to Leopoldville. It may be that the river proves to be navigable for a long distance, and in this case Stanley's march to the Mvutan Nsige will be greatly facilitated.

THE TRANSCONTINENTAL RAILROADS.[1]

THE transcontinental railroads cross great plains, high mountains, lofty plateaus, and broad basins, and follow the courses of long rivers. Nowhere do we find objects of greater interest to the traveller, geographer, geologist, or the student of natural history, than along these lines of travel. The rivers that rise on the eastern slope of the Rocky Mountains pursue an uninterrupted and peaceful course from the foot-hills, across the great plains, to the valley of the Mississippi. The rivers that rise on the western slope encounter range after range of mountains, some higher than the Rockies, and find their way to the ocean over high falls, through deep cañons, or by forcing a way through mountain ranges. Here is the longest persistent range of mountains in the world, — broad plateaus elevated from 8,000 to 10,000 feet above the level of the sea. Here are deep basins, with mountains so closely surrounding them that the streams, unable to find a way to the ocean, sink into the desert. Here is the valley of the Colorado, running through cañons 3,000 to 4,000 feet high, over 200 miles long, and so deep that in some places the sunlight never reaches the bottom. The rain, instead of fertilizing the ground, washes from the rocks every particle of soil, and leaves the country a desolate wilderness, devoid of vegetable or animal life. Here are high snow-mountains, and at their base deep valleys, sunk below the level of the ocean. There are mountains, more beautiful than Mont Blanc or the Matterhorn, rising directly from base to summit, 14,000 feet in height, with glaciers exceeding in extent and beauty any in Europe. From the far north to the extreme south are mines of gold, silver, and copper, and vast deposits of coal, lead, and iron-ore. Here the student of natural history finds fossils in endless variety and number, from the toothed bird to the miniature horse. As a compensation for the want of trees on the mountains, the largest and finest forest-trees in the world are found at their base, on the Pacific coast. The millions of buffaloes which formerly roamed over the plains are all gone, but their places are supplied by countless herds of cattle and flocks of sheep. Such a land is worth visiting; and the description of the country through which the railroads run, and of the roads themselves, must be of interest.

The traveller from the Atlantic to the Pacific by either of the transcontinental railroads enters the great plains, soon after crossing the 95th degree of longitude, near Winnipeg on the north, Omaha and Kansas City in the middle latitudes, or San Antonio at the south. Then commences the ascent, steadily continued until the top of the Rocky Mountains is reached. The land rises, at first slowly, then on steeper grades, and yet so gradually that the passenger on the Union Pacific reaches an elevation of one mile before he has seen the mountains or realizes that he has attained any considerable elevation. From the foot-hills, over the mountains to the Pacific Ocean, each road follows a route having its own features, so striking and distinct that no general description is of any value. The chief objects of interest are the great plains, the rocky mountains, the deep basins, the ranges of mountains west of the Rockies, and the plateau of the Colorado River; while the railroads — the work of man — vie in interest with the natural wonders.

The Great Plains.

Looking from Denver towards the west, or, better yet, from almost any part of the great plains in Colorado within 50 miles of the Rocky Mountains, are seen the foot-hills, then the mountains, rising higher and higher until lost in the distant snow-caps. Looking towards the east are the green and grassy plains falling in gentle undulations, north, south, and east, as far as the eye can reach, and for hundreds of miles beyond. These are the great plains of America, bounded by the Rocky Mountains on the west, the Arctic Ocean on the north, the Gulf of Mexico on the south, the Missouri and Mississippi rivers on the east. The great plains reach their culminating point between Denver and Colorado Springs, — at the divide between the waters of the North Platte and Arkansas rivers. From this elevation of 7,000 feet they slope northeasterly into Wyoming and Canada, towards the Arctic Ocean, easterly to the Missouri River, and southerly into New Mexico. The land, only fairly watered on the east, becomes arid towards the foot-hills of the Rockies, and, though rich and fertile, cannot be cultivated without irrigation. The rivers grow larger towards their sources, as the rainfall on the plains is insufficient to supply the

[1] The unfinished portions of the roads are included in the accompanying map.

loss by evaporation and irrigation; but there is no portion of these plains that deserves the name of desert, or that is comparable in degree of sterility with the cañoned country west of the mountains. It is only a few years since it was called the 'Desert of America,' and it was then believed that the great plains were unfit for cultivation or habitation. Then they began to be used for pasturage of cattle. Now, by a judicious system of irrigation, larger crops of wheat and grain are grown than in the great prairie States, while the detritus from the irrigating water more than compensates for the exhaustion of the soil by the crops.

The Rocky Mountains.

These mountains rise in Alaska, on the Arctic Ocean, far to the north of Sitka, and attain their highest elevation — 20,000 feet — in Mount St. Elias. They run through British Columbia, Idaho, Montana, Wyoming, and Colorado. They appear as high, level plateaus and spurs in New Mexico and Arizona, joining the Coast Range, to appear again as the Rocky Mountains or Cordilleras in Mexico, where they attain the height of 19,000 feet in Popocatapetl, passing thence through the isthmus of Central America into South America, where they form the back-bone of that continent, terminating near the Antarctic Ocean at Cape Horn. Mount Brown and Mount Hooker, in British Columbia, rival Monte Rosa in height. The highest mass of these mountains is in Colorado, where there are nearly one hundred peaks 14,000 feet in height, none of which are 500 feet above or below that height. It is impossible to give definite boundaries to the Rocky Mountains, as they enclose many ranges and systems. Major Powell of the Geological Survey classes the Rocky Mountains into the Park, the Geyser, and the Basin systems. In the mountains and plateaus of these systems bare rocks are seen to an extent rarely found on the globe, and the region is largely destitute of soil and timber. In striking contrast to this destitution are the parks in Wyoming, Colorado, and New Mexico. The largest of these are the North, Middle, and South parks of Colorado, — elevated plains containing from 800 to 1,000 square miles, 9,000 to 10,000 feet above the sea-level, surrounded by high mountains, with a fertile soil, furnishing fine pastures for cattle in summer, but with the warm season so short that wheat and grain do not ripen. In these mountains rise the great rivers of the world, — the Missouri, Mississippi, the Columbia, and Colorado, in North America; and the Amazon and La Plata in South America.

The Geyser system is in Wyoming. The mountains are not so high as in the other systems, but in their recesses lies the Yellowstone Park. Before the geysers of this park "all others in the world, even the celebrated ones of Iceland, sink into insignificance. This park seems to have been set aside by the Great Maker for the exhibition of the action of volcanic forces."

The Great Basin.

The Great Basin, so called because it has no drainage into the ocean, extends from the summit of the Rocky Mountains and the plains of the Colorado River west over one thousand miles, far into California, and from Oregon in the north over fifteen hundred miles south into Lower California, south of Los Angeles and San Diego. It includes the middle and western parts of Colorado, the whole of Utah and Nevada, and parts of Oregon and California. Numerous short ranges run invariably north and south, with deep valleys between them. The greatest of the basins is that of Salt Lake, five hundred miles long and six hundred miles wide, between the Rocky and Sierra Nevada mountains. Here rain rarely falls, and the rivers which rise in the mountains surrounding it on every side are soon dried up, or, like the Carson and Humboldt, after running from 100 to 300 miles, sink into the desert and disappear. Large lakes are formed in the deeper valleys, but the water in them is salt. For hundreds of miles the traveller sees only alkali plains, breathes alkali dust, and drinks alkali water. Far to the south-west is Death Valley, over 150 feet below the level of the ocean, so called from the number of emigrants who lost their lives from hunger and thirst in sight of the snow mountains and close to the promised land. But, as if to compensate for the desert of death, on the opposite side of the Sierras are the Yosemite and the big trees of Calaveras. The mountain ranges west of the Rocky Mountains are popularly called the Cascade, Sierras, and Coast Range.

The Cascade Mountains.

The Cascade Mountains rise in the upper part of British Columbia, follow the coast-line through British Columbia and Washington Territory, passing thence through Oregon, and die out in northern California, to be succeeded by the Coast Range. The snow-line is reached at a lower elevation than in Switzerland, and, unlike the Alps, the great mountains rise directly from the sea 14,000, 15,000, and even 20,000 feet in height. From the sides of Mount St. Elias in Alaska — the highest mountain in America — vast glaciers run into the ocean, exceeding in grandeur and extent any found in Switzerland. Mount Baker and Mount Tacoma in Washington Territory, and Mount Hood in Oregon, radiant with eternal snow, are more beautiful than Mont Blanc or the Matterhorn; the glaciers on Mount Tacoma equal those of these mountains, while, to add to the sublimity of the scene, smoke is frequently seen rising from the craters of Mount St. Elias and Mount Adams. There is probably no other country where, on the same parallel of latitude, and at the same elevation, there are such great differences in climate, soil, and vegetation as on the east and west sides of the Cascade Mountains. On the east are barren hills and plains, devoid of all vegetation save the sage-brush and bunch-grass; the climate is hot in summer, cold in winter, and dry as that of the Desert of Sahara. On the west side of the range, and not fifty miles away, the country is thickly studded with the finest of forest-trees, abounding in vegetable life, with a continuous rainfall, the climate mild in winter and temperate in summer. On the foot-hills and in the western valleys the deep green of the Douglas fir, extending for hundreds of miles, contrasts with the pure white of the snow. The only drawback is the thick clouds of smoke from burning forests, which usually darken the sun and hide the mountains from view for two or three months in the summer.

Sierra Nevada.

The Sierra Nevada Range might be called a continuation of the Cascade Mountains; but those are of volcanic origin, and the Sierra Nevadas are granite, though traces of volcanic action are often found on the flanks and base. It commences at Mount Shasta, 14,400 feet high, and runs in a southerly direction to Tejon Pass, where it joins the Coast Range not far from Mount Whitney, the highest mountain in the United States south of Alaska. There are but few passes over these mountains, and the Pacific slope is very steep, the Central Pacific road descending 6,300 feet in 80 miles.

Coast Range.

This is a long range of sand-stone mountains. Rising in Oregon, south of the Columbia River, it follows the coast through Oregon and California into Mexico, where it unites with the Rocky Mountain Range proper. It is lower than the other ranges, attaining an elevation of 3,000 to 5,000 feet. At the foot of this range, far to the east, is the Willamette River in Oregon, the Sacramento and San Joaquin rivers in California, with long narrow valleys unsurpassed in richness. On the western slope the rainfall is abundant, and the valley and foot-hills are covered with a luxuriant growth of vegetation, — the redwood, Douglas fir, and other members of the *Sequoia* family, more useful than the big trees, and in large groups scarcely less imposing.

The Coast and Cascade ranges run parallel with the coast; and the Fraser, Columbia, and other large rivers, which rise in the Rocky Mountains, find a way through these ranges to the Pacific Ocean. The Fraser River forces its way through a deep cañon, 200 miles long, and makes a route for the Canadian Pacific; the Columbia River breaks through the Cascade Mountains at the Dalles, about three hundred miles south of the Fraser, and makes a way for the Northern Pacific and Oregon Short Line.

Canadian Pacific Railroad.

From Montreal this road follows the rich and fertile valley of the Ottawa 350 miles, then through a wilderness of lakes, rocks, and streams to Lake Superior, around its northern shore, past lakes and woods and over marshes, to the 94th degree of longitude, about 100 miles east of Winnipeg. A more God-forsaken country I have rarely seen, — the land too rocky, thickly wooded, and wet for cultivation, the trees too low and stunted for timber. Mines are supposed

to exist, but are not yet worked to any considerable extent. This was the most expensive section of the road, the outlay being some $12,000,000 for 200 miles, and a single mile of the heavy cuttings and tunnels cost as much as $750,000. The company expended $2,100,000 for explosives, most of which were used on this section. From the 95th degree of longitude, through Winnipeg to Calgary at the foot of the Rockies, it runs across the great plains nearly one thousand miles. The plains are generally rich, and, when irrigated, yield good crops; the rainfall, light at Winnipeg, decreases towards the mountains. The country north of the railroad, on the north branch of the Saskatchewan, is richer, has a greater rainfall, and bears heavier crops. It was on the line of this branch that the first surveys were made, and, under Mount Hooker, the highest of the Rocky Mountains, a pass was found only 3,760 feet high, and a route little longer than the one finally adopted; but beyond this pass the country was so rough and the mountain ridges so numerous that another route was found after the expenditure of over $3,000,000 in the survey of twelve thousand miles of different routes. The ascent from Winnipeg, 700 feet high, is gradual to Calgary, 2,900 feet above the sea-level, thence to the summit at Stephen, 5,296 feet, 150 miles from Calgary. Thence the route descends to the crossing of the Columbia River, where, instead of following the great bend, some 200 or 300 miles, it climbs the Selkirk Mountains to the Glacier Hotel, 4,300 feet high. The glaciers come down the mountains close to the hotel, and are easily reached by a short walk. Here are most beautiful views of glaciers, woods, and mountain peaks, affording varied and delightful excursions to the tourist. Between the first and second crossing of the Columbia River, 80 miles, the road ascends 1,788 feet, and descends 2,761 feet. The Gold Range is then crossed at a low grade, when the road strikes the Fraser River, about 100 miles west of the Columbia, and follows its course through the Cascade Mountains, in deep cañons for a long time considered impassable. After leaving the river, the road runs across the low lands to Vancouver on the sound. This is the shortest line from the 95th degree of longitude to the Pacific Ocean, with the lowest grade and the greatest length on the plains. It is claimed to be the only line that runs from ocean to ocean, and is connected with Japan and China by its line of steamers. The Canadian Pacific Railroad Company received from the Dominion Government grants of money and land far exceeding those paid to any of our railroads, and has recently obtained a subsidy for carrying the mails across the continent.

The Northern Pacific Railroad.

The Northern Pacific Railroad starts from St. Paul on the Mississippi and from Duluth on Lake Superior, 600 feet above tide-water. It runs nearly due west from Duluth, 1,000 miles to Livingstone at the foot of the Rocky Mountains. The country, after leaving Lake Superior, is rough, rocky, and is of little value except for timber, for 150 miles. There the great plains begin, and the land is fertile, producing abundant crops if well watered, for about 600 miles, when the Bad Lands are reached, about 200 miles west of the Missouri River.

The other transcontinental railroads, in crossing the plains, have a regular ascent, following the valleys of rivers, but the Northern Pacific crosses the Mississippi, Red, James, Missouri, and Little Missouri rivers, and the divides between these rivers, at right angles. While there is a general up-grade, the ascent is not as regular as on the other lines. West of the Little Missouri the up-grade continues over the Bad Lands to the valley of the Yellowstone; the road follows that valley for 330 miles, to Livingstone at the foot of the Rockies. The line passes within a few miles of the Big Horn, and there, where eleven years ago General Custer with his entire command was massacred by the Indians, now the peaceful settlers herd their cattle, and cultivate the fields of wheat and grain. At Livingstone the Yellowstone turns south, opening a way into the mountains. A branch of the road runs to the Yellowstone Park, about 50 miles distant, and the traveller is well repaid for the whole journey if he can spend a week in the park. The main line, on leaving Livingstone, crosses the first range of the Rocky Mountains at Bozeman summit, 5,570 feet in height. The road then descends to the valley of the Missouri, and follows down the river, 50 miles, towards Helena, and passes through that mining centre, brilliantly lighted with electric lights, to Mullen Pass, where it crosses the great divide at a height of 5,547 feet, 1,200 miles west of St. Paul, thence, with a general descent, following the waters of Clarke's Forks through Montana and Idaho. Montana, the water-shed between the two oceans, has an elevation of about 4,000 feet above the sea-level. The winters are very cold, the summers hot and dry; only scanty crops can be raised, for there is little rain and few irrigating streams. The cattle range over the plains and mountains in summer, and, if properly fed and protected for two or three months, will stand the long cold winters. When storms come, the cattle, unless protected, drift before the wind for many miles until they find shelter, and when the storm abates slowly return to their grazing grounds. The general elevation of Idaho is lower than that of Montana, and its great lakes soften the temperature, while the warm winds from the Pacific Ocean temper the winter climate. There is more rainfall and better soil; wheat and grain grow in greater abundance. In both of these territories there are great stores of precious metals, the yearly product of Montana being about $25,000,000. The road runs around the beautiful Lake Cœur d'Alene, then for many miles down the Spokane River, with its beautiful falls, to Pasco on the Columbia River. Here the road branches, one line following the Yakima River, crossing the Cascade Mountains at a height of about 4,000 feet, thence to Seattle and Tacoma on Puget Sound. The other branch follows the Columbia River, which forces its way through the Cascade Mountains, at the Dalles and Cascades, to tide-water at Portland, about 100 miles from Astoria at the mouth of the river. The route over the Cascade Mountains, reaching the fine harbors of the sound, will eventually be the main route. The Northern Pacific is comparatively free from the great alkali deserts found on the more southerly roads, and is therefore more comfortable for the traveller. Few more beautiful trips can be found than over this road by the Yellowstone Park to Tacoma, and thence by the Oregon and California road to San Francisco, and home by the Yosemite and the Atchison, Topeka & Santa Fé Railroad.

Union and Central Pacific Railroads.

The Union Pacific Railroad, with its Kansas branches, the Chicago, Burlington & Quincy, and the Atchison, Topeka & Santa Fé, cross the great plains from the Missouri River to the foot-hills of the Rocky Mountains, over a country very similar to that crossed by the Canadian Pacific, but with steeper grades. The Union Pacific begins at Omaha, runs thence 500 miles to Cheyenne on an up-grade averaging ten feet to the mile, increasing in steepness as it approaches the foot-hills; then it rises more rapidly, reaching the summit at Sherman, 8,240 feet above the sea-level, 550 miles from Omaha. From thence to the top of the Wasatch Range it runs on an elevated plateau, nowhere less than one mile and a quarter above the sea-level; it then descends rapidly 3,800 feet to Salt Lake, follows the Humboldt Mountain, and crosses the Humboldt Valley, over 300 miles, until the river sinks into the desert, then rising rapidly to the summit of the Sierra Nevadas, 7,000 feet, passing by Tahoe, the most beautiful of lakes, then down a grade, which when it was built was the longest and most rapid descent in the world, to tide-water near Sacramento. On turning round a promontory called Cape Horn, near the top of the Sierras, the traveller looks down a perpendicular descent of 2,000 feet into the valley of the American River, — one of the most beautiful views in the mountains.

The Union and Central roads were the first transcontinental railroads built. The construction was carried on during the civil war, and was finished only four years after its close. The grades are much heavier than those of either of the other roads, and it runs for a longer distance through the mountains. The grades are so unfavorable, compared with other lines, that the Union Pacific has sought another outlet by the way of the Oregon Short Line to the Pacific, and the Central Pacific has found an easier route to the Atlantic by its Southern Pacific Railroad. The Oregon Short Line, a road built and leased by the Union Pacific, leaves the main road at Granger, 875 miles from Ogden, crosses the Rocky Mountains at an elevation of 6,279 feet, to the Snake River at American Falls, 1,100 miles from Ogden, and follows the valley of this river to the Columbia, at Walla Walla junction. The valley of the Snake River

is fertile. It produces fine crops with little, and in many places without any, irrigation, not on account of a greater rainfall, but from the different character of the soil. The grandest scenery in the mountains is found on the Denver & Rio Grande Western Railroad. This road starts from Ogden, the junction of the Union Central Pacific Railroad, traversing the valley of Salt Lake and its River Jordan, crossing the many ranges of the Rockies by passes over two miles above the sea-level, through deep cañons so steep and narrow that in the Royal George Cañon the road is carried along the river on a bridge, no way being found for the road on the mountain side. At the eastern terminus the Denver and Rio Grande road connects with the Atchison and Topeka at Pueblo, and with the Union Pacific at Denver.

Atchison, Topeka & Santa Fe.

Kansas City has heretofore been the starting-point of this line, but it is now being rapidly extended east to Chicago, and will soon run a through train from Chicago to the Pacific Ocean. From the eastern boundary of Kansas it follows the line of the Arkansas River 600 miles west to La Junta, 4,000 feet above the level of the sea. Here it turns and runs to the south-west, 330 miles, to Albuquerque, thence turns and runs due west to the Pacific Ocean. It crosses two ranges of the Rocky Mountains, the first at Rincon, on the boundary line between Colorado and New Mexico, the highest pass on the road, 7,600 feet; the second at the continental divide, 1,000 miles from Kansas City, 7,200 feet high; thence along a high plateau nowhere less than one mile in elevation, 700 miles, following the Little Colorado River; thence it descends rapidly 125 miles, to the Needles, where it crosses the Colorado River at the boundary line between Arizona and southern California, 477 feet above tide-water. Then the Sierra and Coast ranges are crossed, at a height of about 3,000 feet, and tide-water is reached at Los Angeles, San Diego, and San Francisco. Near Albuquerque, 900 miles west of Kansas City, is a branch of the road to Santa Fé, the old city of the plains, famous for its Mexican remains. Here, too, are the hot springs of Los Vegas, having a winter climate unequalled for health. The air is dry and bracing, and more temperate than that of the far-famed Colorado Springs. Holbrook, 1,100 miles from Kansas City, is sixty miles from the renowned Pueblos of the Moquis tribe of Indians.

The Plateau Country, so called, through which the Colorado River and its branches run, is reached either from Peach Springs, 1,400 miles from Kansas City, by a stage-road, only 16 miles, to the Grand Cañon, or from Flagg Staff, 60 miles from Point Sublime. Here is the sublimest scenery on the continent, as yet but little visited for want of easy means of access. The more it is known, the greater will be the number of visitors. The Plateau Country is the land of cañons, all of which lead down to one great trunk-channel cleft through the heart of the Plateau Country, 800 miles long, and with a depth of from 2,000 to 6,000 feet. Of the many cañons in the plateau, the Grand Cañon is the "most magnificent as well as the grandest geological section of which we have any knowledge." It is 218 miles long, from 4,500 to 6,000 feet deep, averaging 5,000 feet. Its width from crest-line to crest-line is from 4½ to 12½ miles, the widest portion being always the grandest. Not far from the Grand Cañon, near Peach Springs, is Little Zion Valley, a cañon running into the Grand Cañon. "In its proportions it is almost equal to the Yosemite, but in its nobility and variety of the sculptured scenery and wonderful variety of colors, there is no comparison.

Southern Pacific Railroad.

It is hardly possible to realize how recently the territory through which this road runs came into our possession. California in 1846 was an "outlying and neglected Mexican province." New Mexico, Arizona, and southern Colorado were purchased of Mexico in 1853, under the Gadsden treaty, for $10,000,000, "because the low level of the mountains below the Gila was the natural route for a southern transcontinental railway." Soon after the purchase, schemes were formed in the East for constructing a Southern Pacific road. Fifteen years ago a few hundred miles of road were built in Texas, and the promoters applied to Congress for a subsidy. Then the managers of the Central Pacific, who controlled all the business of the Pacific slope, determined to construct the Southern Pacific without a subsidy, and thereby retain their monopoly. The road was commenced in the year 1875, and was completed in 1881. The eastern termini of this road are at New Orleans and Galveston. Like the Canadian Pacific, it crosses the continent from ocean to ocean. It passes through the rich lowlands of Louisiana and Texas, reaching the great plains a little west of San Antonio. Near this city it meets the Rio Grande River, follows its valley, ascending by a steady grade to El Paso, 1,200 miles from New Orleans; thence through New Mexico and Arizona on an elevated plateau about 4,000 feet high for 200 miles, by the foot-hills and over the spurs of the Rocky Mountains, to the continental divide at Dragoon Summit, 4,614 feet above tide-water; thence over the valley of the Gila and its branches to the Colorado River, which it crosses at Yuma near the mouth of the Gila, through a dry and arid desert rich in mines of silver, copper, and lead, — a country long desolated by the Arapahoes; thence down into the great desert of California, 260 feet below the level of the sea, and over a low range or spur of the Sierras to tide-water at Los Angeles and San Diego (the country near Los Angeles is the garden of California, where the orange-tree buds, blossoms, and ripens its fruit all the year round); then over the main range of the Sierras at Tehachapi, 4,026 feet high, and down into the valley of the San Joaquin and Sacramento rivers to San Francisco. The grade of the road is lower and more favorable than that of either of the other transcontinental roads. It is a favorite route for passenger travel in the winter and spring. In the summer the heat is so intense and the dust so thick as to render it uncomfortable.

The great plains begin at San Antonio, and run about 700 miles to the foot of the mountains near El Paso. They are much lower than in Colorado, Utah, and Wyoming, but are more arid. Occasionally on the plains west of San Antonio there has been no rainfall for one and even two years. These plains would make the finest pastures for cattle when there is sufficient rain, as the snows are light, the winters warm, and the pastures good the year through. This road and the Atchison, Topeka & Santa Fé are the only roads without snow-sheds.

The Union and Central roads, when built, relied almost entirely upon the through business, now mainly upon local business, as the through business has become of comparatively little importance because it is divided among five lines. The increase in the number of roads and the large reduction of rates have stimulated emigration, and thus the business, both through and local, is steadily and rapidly increasing. Each road now does as much business as the Union and Central when they monopolized the whole. The construction of competing roads has resulted in great benefit to the public, and, when the local business is built up, the revenues and profits of the several roads must be very large.

Other roads are also seeking new routes across the mountains. The St. Paul, Minneapolis & Manitoba has constructed several hundred miles in Dakota, and is constructing its road at the rate of five miles a day, through Manitoba and up the Missouri River to Fort Benton. It is also reported that parties in the interest of this line have commenced the construction of a line from Seattle, across the Cascade Mountains, down the Yakima River, to the Moxee Valley, and thence across to the great bend of the Columbia. The Chicago and Northwestern has already crossed the great plains in Nebraska and Wyoming, to the foot-hills of the Rocky Mountains, 1,000 miles west of Chicago, and will ultimately be forced to seek a route over the Rocky Mountains, along the northern fork of the Platte River.

Comparative Statement.

It will be interesting to compare the elevation and length of the different transcontinental railroads. The greatest average elevation of the mountain system of North America is in southern Wyoming and the western part of Colorado. It therefore follows that the passes over the mountains should be the highest in this section.

The highest railroad passes are: —

Kicking Horse Pass, on Canadian Pacific	5,596	feet.
Bozeman Pass, Montana, on Northern Pacific	5,570	"
Sherman Pass, Wyoming, on Union Pacific	8,235	"
Pass on Denver & South Park Railroad, Union Pacific	11,250	"
Marshall Pass, Colorado, on Denver and Rio Grande, about	12,000	"
State Line, Colorado, on Atchison, Topeka & Santa Fé	7,622	"
Dragoon Summits, on Southern Pacific	4,614	"

The length of the several roads, the width of the great plains and mountains, are controlled by the configuration of the continent. The Rocky Mountains run in a south-easterly direction, while the trend of the coast is southerly, even a little south-westerly, to San Francisco, and then south-easterly to the Isthmus of Panama. This causes a diminution in the width of the great plains on the line of the Union and Central Pacific roads, and a corresponding increase in the width of the mountain systems and in the length of the road. On the Canadian Pacific the great plains are 1,000 miles wide, and the mountains about 500 miles wide. On the Union Pacific the plains are 500 miles in width, the mountains 1,300 miles.

The distances on the several roads from a common degree of longitude, say the 97th, to the Pacific Ocean, is shown in the following table: —

Canadian Pacific to Vancouver	1,480 miles.
Northern Pacific to Portland	1,620 "
Union Pacific and Oregon Short Line to Portland	1,724 "
Union and Central Pacific to San Francisco	1,885 "
Atchison, Topeka & Santa Fé to San Diego	1,694 "
Southern Pacific to San Francisco	2,024 "
Southern Pacific to San Diego	1,610 "

All these roads require a harbor at the terminus on the Pacific coast. North of the lower end of Puget Sound the coast is studded with islands and excellent harbors. From Puget Sound south the mountains rise almost directly from the ocean, there are few islands, and the only harbors are at the mouths of the rivers, and these are generally barred.

The Canadian Pacific finds a harbor at Vancouver on Puget Sound; the Northern Pacific was forced to cross the Cascade Mountains to reach a good harbor at Seattle and Tacoma on the sound; the Oregon Short Line has its terminus at Portland, 100 miles from the mouth of the Columbia River, where there is a bar which cannot be crossed in stormy weather; the Central and Southern Pacific have good harbors at San Francisco and San Diego; the Atchison, Topeka & Santa Fé at San Diego.

GARDINER G. HUBBARD.

PSYCHOLOGICAL MEDICINE AT THE INTERNATIONAL MEDICAL CONGRESS.

THE programme of the Section of Psychological Medicine and Diseases of the Nervous System, at the recent congress, was a highly promising one. It announced the reading of a variety of interesting papers, and a very large representation of foreign specialists amongst the readers. But the programme was widely diverged from, and, of the forty papers announced, less than half (and not, perhaps, in every respect the best half) were presented. Hardly one-quarter of the foreign delegates who were announced to present memoirs were present to do so. While thus the expectations aroused by the inviting programme were naturally destined to disappointment, the proceedings of the section are by no means to be considered unsuccessful. Like the other sections, it suffered considerably by the absence of the leading specialists of the United States. Had the acknowledged leaders of American neurology been announced to be present and to actively participate in the proceedings, not only would all the distinguished foreigners who announced their coming have had greater inducements to come, but the meeting would have recorded the high-water mark of neurological science. Judging the proceedings by the same standard that is to be applied to the entire congress, much can be said in its favor, and some interesting observations and suggestions can be culled from its deliberations. The address of the president of the section, Dr. J. B. Andrews, gave a very useful summary of the distribution and care of the insane in this country. Throughout the country there is one insane person to 545 individuals; but this ratio does not hold for all the various elements. The leaders of our civilization, and, above all, the foreign element, who have the difficult problem of adapting themselves to a violent change in their life-habits amid the pressure of a sharp competition, are the victims of mental break-down. One in every 250 of the foreign population is insane, one in 618 of the native whites, and only one in 1,097 of the colored population. But even in the last mentioned their emancipation and free admittance to civilization have more than doubled their former percentage of insanity. This fact — that insanity is a disease of civilization — is also shown by the fact that the prevalence declines as we move towards the west and away from the cities. Insanity, moreover, is on the increase, and in this country at the startling rate of nine per cent per annum. Dr. Andrews also described the great improvement in the rational care of the insane (and this, in part, accounts for the increased longevity, and thus the increased number, of this class), and added, that, if this country had little new to show, it at least manifested its ability to keep abreast with the progress of other countries.

Dr. D. Hack Tuke of London sent a paper in which he compared the insane of this country with those of England. The difference in the nature of the asylums of the two countries makes an accurate comparison impossible, but such comparison yields much more similarity than difference. Dr. Tuke favored the 'segregation' plan, in which one patient, or at most a few, are under care in the same homestead, and welcomed the now general agreement that mechanical restraint was to be used only in exceptional cases, but that in such cases it is to be unhesitatingly employed.

Dr. H. M. Hurd of Michigan presented a valuable sketch of the development of religious insanity, tracing the relation between the nature of the morbid delusion and its physical excitant, and again with the age, sex, mental development, etc., of the individual. The healthiness of the religious sentiment lies in a just development of the emotional with the intellectual faculties.

Dr. Langdon Down of London described several interesting cases in which mental deficiency was associated with a prow-shaped cranium. The cause of this, Dr. Down referred to an abnormal juncture of the medio-frontal suture. The break-down in such cases may occur at any important change, — at first or second dentition, at puberty, or even later, — and the deficiency may vary from mere stammering and sluggishness of thought to marked idiocy. The education of children with this cranial mark should be a most special and careful one.

Dr. Horace Wardner of Illinois showed most conclusively the admirable effect of occupation in insanity. In a well-managed asylum eighty per cent of the inmates can be usefully employed, and this employment made an essential factor in their cure: it diverts their mind from brooding over themselves and their imaginary ills, prevents *ennui*, and establishes a healthy rhythm. Dr. Wardner cited several cases in which the occupation learned in the asylum became a means of livelihood after dismissal from the asylum. Such patients, while not cured, were yet able to begin life anew on a lower and simpler plane: they had not regained full mental power, but occupation had rescued them from chronic insanity to a condition of social usefulness.

Dr. G. Fielding Blandford of London presented before the entire congress a paper on the treatment of recent cases of insanity in asylums and in private houses, originally intended for this section. He showed how frequently a violent outbreak of mania passes away quite suddenly, and leaves the patient in full health. In all such cases the stigma, rightly or wrongly, attached to having been in an asylum can and should be avoided. The physician should have the right to keep patients of this general class outside of an asylum long enough to judge whether such a course is necessary or advisable. Dr. Blandford then gave criteria for distinguishing between cases which could be best cured in a private house and those who needed the 'judicious neglect' of a public asylum. Reform in the treatment of the insane will certainly take place in the direction indicated by Dr. Blandford.

Dr. T. W. Fisher of Boston spoke on the modern equivalents of 'monomania.' He found these in the current terms 'paranoia' (which corresponds closely to 'crankiness'), the German 'primäre verrücktheit,' and the like: he argued for the separate recognition of this form of mental alienation, and gave certain marks by which to distinguish it.

Professor Mendel of Berlin, in a paper on moral insanity, advocated a disuse of the term on the ground that it was either a form of congenital imbecility or an accompaniment of paranoia resulting from a systematic delusion, and that it was a dangerous plea to bring before the courts.

Several anatomical papers were presented. Amongst these, one by Professor Mendel, on the origin of the ocular branch of the